CENTRAL MINE RESCUE STATION, THE CLEVELAND-CLIFFS IRON CO. MATHER MINE B SHAFT, NEGAUNEE, MICH.

BY ROY G. STOTT, R. O. PYNNONEN, AND JOHN A. JOHNSON

* * * * * * * * * **Information Circular 7702**

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by

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INTRODUCTION

In recent years there has been no loss of life from fires in the underground mines of the Lake Superior district, but numerous minor fires and several serious ones involving loss of property and production have occurred. The iron-ore-producing companies recognize that well-equipped mine rescue stations are a valuable asset against the ever-present danger of mine fires or the possibility of hazardous atmospheric conditions underground. Prompt action by trained and properly equipped rescue teams is recognized as the prime essential in saving lives, property, and production when fires occur. To achieve this purpose, the mining companies have provided themselves with mine rescue equipment and maintain trained mine rescue crews. This circular describes how one progressive company has provided, maintained, and improved upon such protection for its underground iron-ore mines on the Marquette and Menominee iron ranges of Michigan's upper peninsula.

SUMMARY

The central mine rescue station of The Cleveland-Cliffs Iron Co. at Negaunee, Mich., has provided the company's mines with competent and well-equipped mine rescue teams. The new central mine rescue station at the Mather mine "B" shaft has the distinction of having underground training facilities provided as a part of the station. The company maintains the largest trained force in mine rescue in the Lake Superior district, and mine rescue training is employed as a part of the accident- and fire-prevention program. One of the most important results has been the promotion of closer cooperation and understanding between the management and the workmen. In addition to the service rendered to company mines, the station and its personnel have given assistance to others. The station and its equipment have also been used for training several nearby community volunteer fire departments. This mine rescue station and its personnel have been a dependable and valuable asset to the community in which it is located.

ACKNOWLEDGMENTS

The cooperation of the officials of The Cleveland-Cliffs Iron Co. in furnishing the information, advice, and assistance made this circular possible. Particular acknowledgment is made to A. J. Stromquist, director of safety, and T. W. Hill, safety engineer of the company, whose assistance in the preparation of this circular is typical of the fine cooperation they have extended the Bureau of Mines for many years.

GENERAL INFORMATION

The Cleveland-Cliffs Iron Co. operates 6 underground mines (fig. 1) and 2 open-pit mines on the Marquette iron range in Marquette County, Mich., and 1 underground

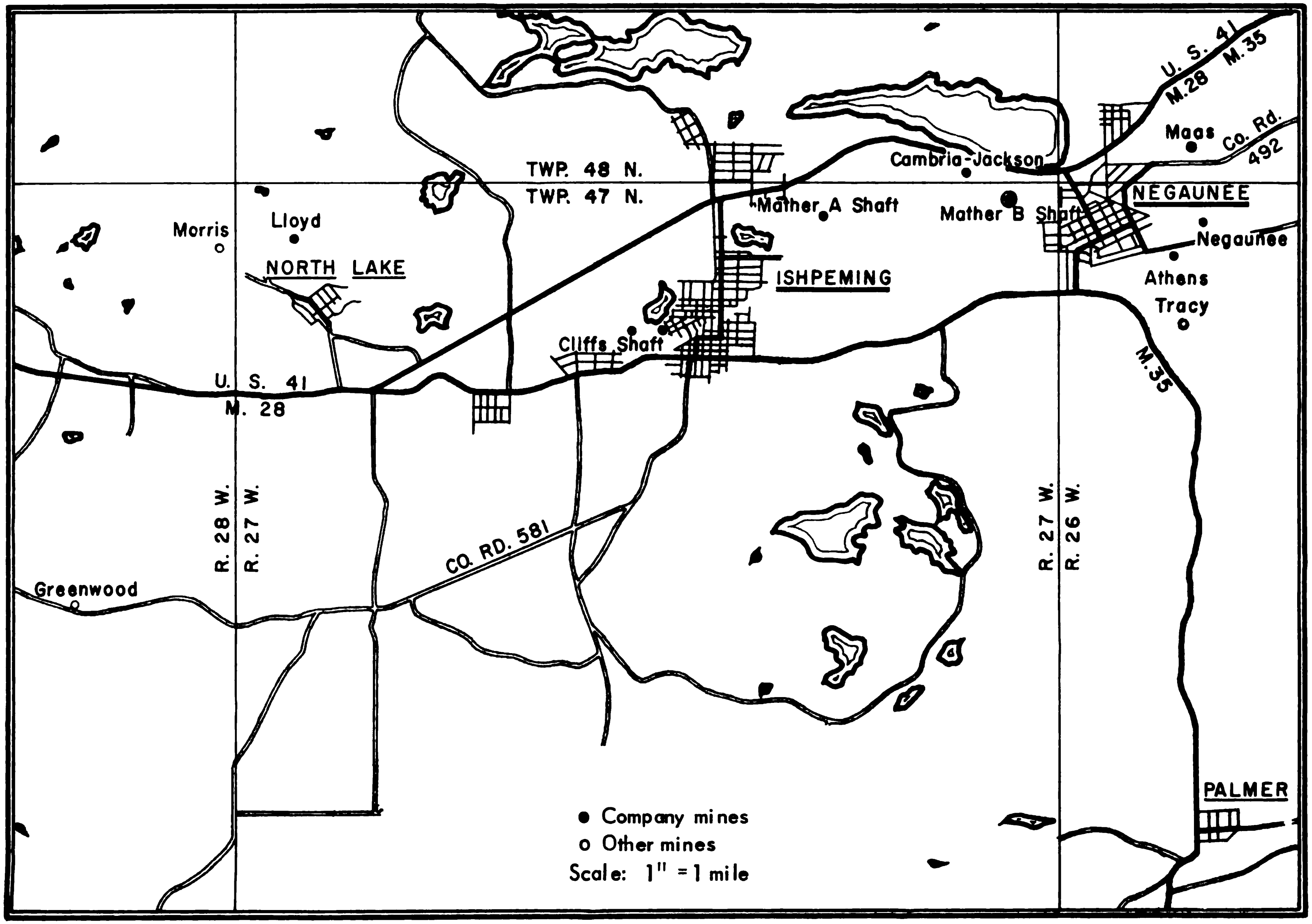

Figure 1. - Area served by central mine rescue station, The Cleveland-Cliffs Iron Co.

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mine on the Menominee iron range in Iron County, Mich. The company, originally known as the Cleveland Iron Mining Co., was the second mining company to mine iron ore in the Lake Superior district and shipped its first ore in 1854. During the 1953 season the company shipped 4,365,996 tons from its Marquette range underground mines and 177,406 tons from the Menominee range underground mine.[4] The company was one of the first in the district to provide mine rescue facilities to serve its mines and has maintained a central mine rescue station for many years.

The company's mine rescue station equipment was moved in 1951 from the Negaunee mine to the new Mather mine B shaft surface-plant building (fig. 2), where special features had been provided to improve the efficiency of the station. With the station situated at the new location, the most distant underground mine operated by the company on the Marquette Range was reduced to 6 miles, and the mine rescue equipment was made readily available to 6 of the company's 7 underground mines. The other mine, the Spies-Virgil, near Iron River, Michigan, is about 77 miles southwest of the station.

There were 2,180 men employed underground at the 6 Marquette range mines during 1953, and 73 men were employed underground at the Spies-Virgil mine on the Menominee range. All of these mines are served by excellent, well-maintained roads.

On several occasions in the past 15 years the mine rescue organization has been called upon to fight mine fires. Through prompt action at least four of these fires, which could have been disastrous, were extinguished by direct methods. In one instance eight men were led through smoke to safety while wearing self-rescuers that had been brought to them by a rescue crew. On another call the organization and equipment aided a nearby mining company to seal an underground mine fire. The call for help came too late to permit fighting the fire by direct means.

UNDERGROUND MINES

All of the company's underground mines are highly mechanized, with electric and pneumatic equipment. Trolley and battery, and combination trolley and battery locomotive haulage are employed on main levels, and all main haulageways are illuminated by electric lighting. Fuse and electrical blasting are used, and the broken ore is scraped into gathering raises. All of the mines are 100-percent equipped with electric cap lamps for miners.

The following brief description of the mines served by the central mine rescue station is presented to give the reader an idea of the possible fire hazards in each mine.

Bunker Hill Mine

The Bunker Hill mine is situated within the corporate limits on the eastern side of Negaunee. The mine, formerly opened and served by a 4-compartment shaft 2,480 feet deep, is now provided with 2 shafts. The main haulage levels are connected to the facilities of the old Negaunee mine, which has been worked out. The old Negaunee mine shaft, surface plant, and stockpile area now serve the Bunker Hill mine. The Athens shaft, used since 1917 as a main production shaft, has been endangered by surface subsidence and now is being used exclusively as a ventilation shaft. Mining operations are conducted on four levels through extensive drifts,

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4/ Skillings' Mining Review, Jan. 23, 1954, p. 6.

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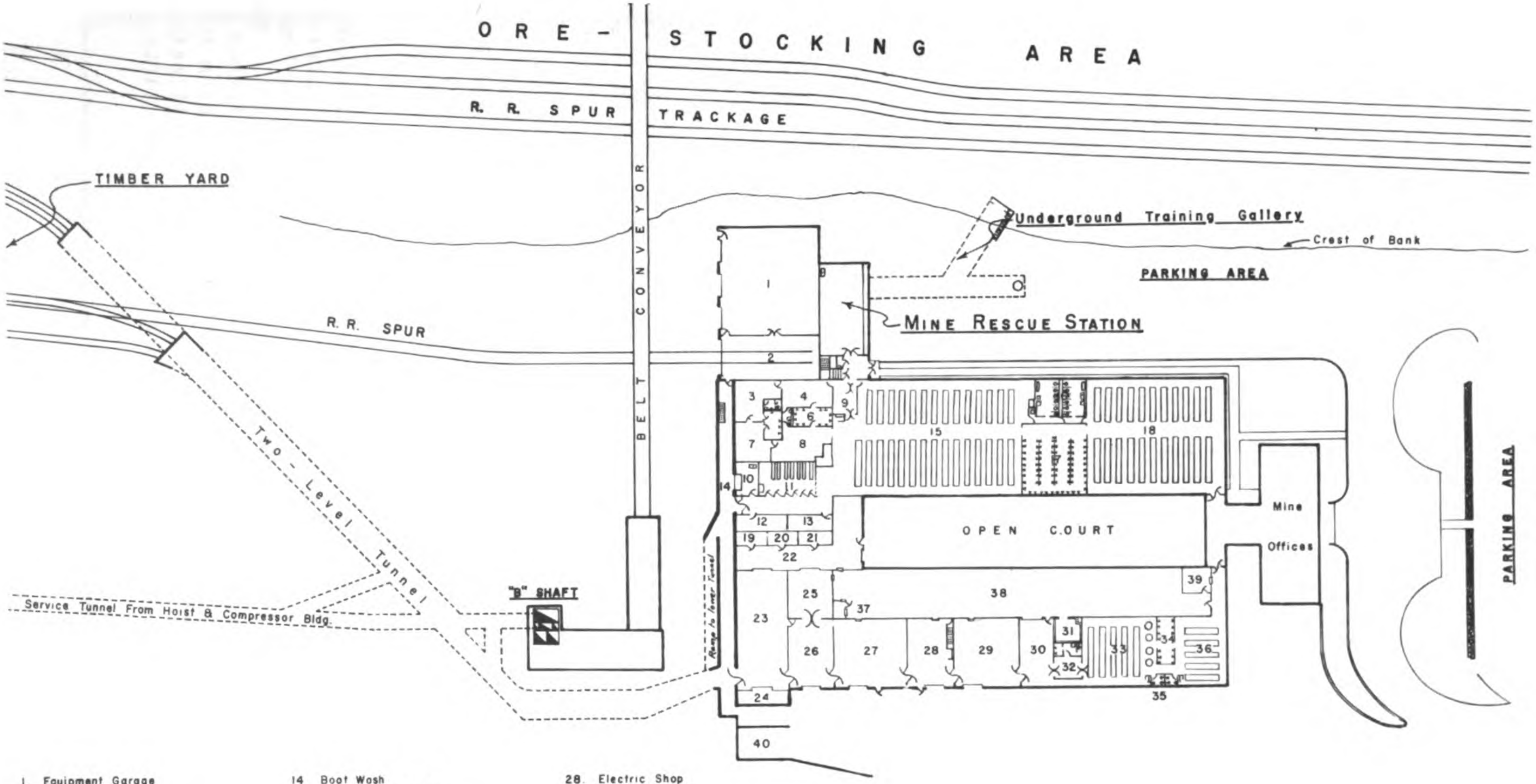

1. Equipment Garage
2. Coal-Delivery Room
3. Captain's Clean Clothes
4. Shift Bosses' Clean Clothes
5. Captain's Shower Room
6. Shift Bosses' Shower Room
7. Captain's Mine Clothes
8. Shift Bosses' Mine Clothes
9. First-Aid Room
10. Laundry Room
11. Lamp Room
12. Fuse Room
13. Time Checker Room
14. Boot Wash
15. Mine Clothes Room
16. Lavatory
17. Shower Room
18. Clean Clothes Room
19. Chain-gang Store Room
20. Acetylene-Tank Storage
21. Switch Room
22. Storage
23. Drill Shop
24. Steam-Cleaning Room
25. Welding Shop
26. Blacksmith Shop
27. Machine Shop
28. Electric Shop
29. Carpenter Shop
30. Truck Drive-in
31. Oil Storage
32. Surface Foremen's Change Rooms
33. Surface Crew Dirty Clothes Room
34. Shower Room
35. Lavatory
36. Surface Crew Clean Clothes Room
37. Warehouse Supplyman's Office
38. Warehouse
39. Warehouse Clerk's Office
40. Iron Racks

Figure 2. - Plan of central mine rescue station and appurtenant facilities, Mather mine B shaft, The Cleveland-Cliffs Iron Co., Negaunee, Mich.

crosscuts, and raises developed to mine the soft hematite ore by sublevel caving and block-caving methods. Considerable timber is used to maintain the mine openings, and large quantities have accumulated in the timber mat gob of previous mining.

There have been 6 reported fires underground in the past 15 years. Two of the fires started in the timber gob and caused serious losses of production. Prompt action by the mine rescue organization on several occasions in the past 11 years has prevented loss of production from fires. On 3 occasions the mine rescue crews extinguished underground fires by direct methods, and on 1 occasion a fire in the timber gob of an old fire area was sealed and extinguished (by means of carbon dioxide gas) in such a manner as to permit normal operation of the mine.

During 1953 the mine employed 311 men underground and shipped 573,767 tons of iron ore.5/

Maas Mine

The Maas mine is within the city limits of Negaunee about 1 mile north of the Bunker Hill mine. The mine is opened by a 4-compartment shaft, 1,625 feet deep, to the 6th level. A 7th level has been developed from a winze 1,250 feet south of the shaft. The levels are spaced 125 feet apart vertically, and several openings to the abandoned workings of the old Negaunee mine are used for emergency escape and ventilation purposes.

The mine has extensive drifts, crosscuts, and raise development from which the soft hematite iron ore is mined on three levels by sublevel-caving and block-caving methods. This mine, like the Bunker Hill mine, requires considerable quantities of timber and has a thick timber-mat gob over most stope areas. Generally, the mine is rather wet.

Three minor underground fires of electrical origin have been reported in the mine during the past 15 years. All these fires were extinguished without need of respiratory protective equipment.

The mine was opened in 1902 and has shipped ore continuously since 1907. During 1953, the mine employed 311 men underground and shipped 562,100 tons of ore.6/

Cambria-Jackson Mine

The Cambria-Jackson mine is near the south shore of Teal Lake in the city limits of Negaunee. The mine is within one-half mile of the central mine rescue station and is opened by 2 shafts, a 3-compartment vertical main hoisting shaft about 1,586 feet deep and a 3-compartment vertical ventilation shaft 651 feet deep. The bottom level of the mine has been developed from a winze 105 feet in depth. There are underground connections to the Mather mine A shaft.

The Cambria-Jackson mine has a long record of production. It was opened in 1874. The principal mining methods employed are sublevel stoping and sublevel caving. Openings in the ore are timbered, whereas the development openings in the hanging-wall slates and jasper require only occasional support.

5/ See footnote 4.
6/ See footnote 4.

Two minor fires of electrical origin have been reported in the mine in the past 15 years. Both were promptly extinguished, 1 without the need for respiratory protective equipment and 1 requiring respiratory equipment.

The mine employed 181 men underground and shipped 349,622 tons of soft hematite iron ore in 1953.[7]

Mather Mine

The Mather mine is the company's newest and largest underground mine. It is opened by 2 shafts, the A shaft, in the northeastern city limits of Ishpeming, and the B shaft, about 8,000 feet due east, within the city limits of Negaunee. Both shafts have four compartments, and each is equipped with a surface plant, hoisting facilities, and ore-stocking grounds. The A shaft was bottomed at a depth of 2,955 feet in 1953, and the B shaft was completed at a depth of 3,080 feet in 1949. With the exception of the cage guides, both shafts were constructed of fire-resistant materials.

Minor amounts of timber are used for lagging, in raise and chute construction, and for miscellaneous mine use; however, the use of timber has been minimized to a great extent in the mine by the utilization of incombustible lagging, steel sets, and concrete support (fig. 12).

Five minor fires have been reported in the mine, 4 of electrical origin and 1 from welding. All were extinguished by direct means without loss of production. In one instance a fire occurred in a combination trolley-battery locomotive. Eight men were working beyond the smoke. A mine rescue team called to the scene took self-rescuers to the men and led them to safety through the smoke to the shaft. A second rescue team extinguished the fire.

The principal mining method employed at the Mather mine is block caving, using slusher transfer drifts. Sublevel caving and sublevel stoping are also used to a limited extent. During 1953 the mine employed 929 men underground and shipped 2,248,146 tons of hematite ore.[8]

Cliffs Shaft Mine

The Cliffs shaft mine was opened in 1881 and is now served by 2 production shafts, the A and the B shafts, approximately 840 feet apart in an east-west line. A third shaft is under construction and, after completion in 1955, will serve as the main hoisting shaft. The A and the B shafts are in the corporate limits of the city of Ishpeming, and both are about 1,050 feet deep.

This mine produces a premium-grade, hard hematite iron ore by means of open-stope room-and-pillar mining methods, leaving about 25 percent of the ore as pillars to support the city of Ishpeming and the surrounding area. The workings are very extensive, and mining is conducted on 15 active levels. Very little combustible material is used underground, and few openings require support.

The mine employed about 357 men underground and shipped 517,715 tons of iron ore during 1953.

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[7] See footnote 4.
[8] See footnote 4.

Lloyd Mine

The Lloyd mine is the company's westernmost underground mine on the Marquette range. It is situated about one-half mile north of the village of North Lake about 5 miles northwest of Ishpeming. The mine was opened in 1909 and has 2 vertical shaft openings, a 4-compartment main hoisting shaft 1,507 feet deep and a 2-compartment ventilation shaft 875 feet deep.

Considerable quantities of timber are used underground. The principal mining method is sublevel stoping. Mining is conducted from the bottom two levels, and the mine generally is quite wet.

No underground mine fires in this mine have been reported during the past 15 years.

In 1953 the mine employed 91 men underground and shipped 114,646 tons of iron ore.9/

Spies-Virgil Mine

The Spies-Virgil mine is on the Menominee range near the village of Mineral Hills, about 1-1/2 miles north of Iron River, Iron County, Mich., and about 77 miles by road from the mine rescue station.

The Spies-Virgil mine was first opened in 1912 and is served by 2 shafts, the Spies or main hoisting shaft and a ventilation shaft about 6,000 feet eastward. The former is a 3-compartment, vertical shaft 1,250 feet in depth, and the latter shaft is connected to the mine workings through a series of underground raises. The mine openings require little support, and the ore is mined by sublevel stoping methods.

This mine and others in the district are plagued by sulfur fires originating from spontaneous combustion of iron sulfides and carbonaceous matter in the black slates that frequently occur adjacent to the ore bodies. There is no known method for permanently extinguishing such fires. Normally, these fire areas are sealed; however, a few such stopes have been filled and the ore pillars successfully recovered. This mine has had 1 new outbreak of sulfur fire in the past 2 years and 4 instances in the past 15 years that required resealing of an old fire area. All the Virgil workings and its fire areas are sealed from the ventilation circuit.

The mine employed 73 men underground and shipped 177,406 tons of iron ore in 1953.10/

MINE RESCUE TRAINING

Personnel

The central mine rescue station and the training of personnel are under the supervision of the company director of safety, A. J. Stromquist, who has had considerable experience in mine rescue work in his 14 years with the Federal Bureau of Mines and 12 years with the company. He has been certified by the Bureau as a permanent first-aid and mine rescue instructor and examiner.

9/ See footnote 4.
10/ See footnote 4.

The company safety department is staffed by the director and four assistants to serve the Michigan mines. Three of the four assistants have been certified by the Federal Bureau of Mines as mine rescue instructors. One of these men has been certified as a permanent mine rescue instructor. In addition to the above, one of the company's mining captains has been certified by the Federal Bureau of Mines as a mine rescue instructor.

Approximately 10 percent of the 2,253 company employees working underground receive mine rescue training twice a year. Upon completion of the training conducted during April 1953, the complement of fully trained crew members, each possessing a Federal Bureau of Mines mine rescue certificate, numbered 179 men. Seventy-six others, all former qualified rescue men, now needed for fresh-air base and supervisory work during an emergency, were issued certificates stamped "Not qualified to wear oxygen breathing apparatus at mine fires and explosions", because of overweight, insufficient teeth, or overage (over 50 years old). Of the 255 trained men, 126 were mine supervisors. The others were selected because of their particular skills, ability, or knowledge. The trained personnel include mechanics, electricians, repairmen, timbermen, pipemen, motormen, welders, miners, mining engineers, and men trained in the operation of underground pumps. The average age of fully qualified members is 35 years. A record of the 1953 training, by mines, is shown in table 1. Generally, about 20 percent of the men trained each year are new men who receive the Federal Bureau of Mines standard 20-hour initial mine rescue course by Bureau or company instructors.

Listings of mine rescue team members are kept at the station, at each mine superintendent's and mine captain's office, at the Safety Department office, and at the homes of each member of the safety department. These lists give the name and occupation of each crew member, his address and phone number, the mine at which he works, and his brass-check number.

Training

All mine rescue training and maneuvers are conducted at the central mine rescue station. The training includes instruction regarding: (1) The construction, use, and limitations of the various types of oxygen breathing apparatus and respiratory protective equipment kept at the station; (2) mine gases and their hazards; (3) the various types of gas-detecting devices and equipment, their construction, limitations, and proper use; (4) the erection of barricades against mine gases as a means of saving lives if men are trapped by fire; (5) mine rescue procedures; and (6) the use of various types of fire extinguishers, fire hose, and high-pressure fog nozzles. Crew members are required to participate in training periods wearing oxygen breathing apparatus for (1) practice in building fire stoppings; (2) the use of line brattice to clear away smoke and advance the fresh-air base; (3) the use of gas-detecting equipment; and (4) practice in direct fire-fighting methods under actual smoke and heat conditions in the station training gallery. At training sessions, mine fires are spotted on blackboard sketches of actual mine workings, and detailed mine rescue procedures are discussed. Crew members frequently contribute problems concerning their own working places underground. Mine rescue crew members are also given first-aid training.

Retraining is conducted twice a year, for a total of 16 hours for each man. All new men receive at least 6 hours of apparatus-wearing practice before being submitted to actual smoke and gas (formaldehyde) conditions in the training gallery.

TABLE 1. - 1953 mine rescue training record, The Cleveland-Cliffs Iron Co., Marquette- and Menominee-range mines

	Bunker Hill mine	Maas mine	Cambria-Jackson mine	Mather mine	Cliffs shaft mine	Lloyd mine	Spies-Virgil mine	Eng. & Safety Depts.	Total
Ave. employment (1953):									
Surface.............	115	69	43	385	118	40	32		802
Underground..........	311	311	181	929	357	91	73	77	2330
Total..............	426	380	224	1314	475	131	105	77	3132
No. of shifts operated.	3	3	3	6	3	3	3	1	
No. of supervisors	31	23	13	81	29	10	9	8	204
No. of supervisors trained in mine rescue: (1953)									
Initial	1	5	0	10	0	0	0	1	17
Additional	12	7	3	56	9	1	0	3	91
Other[1].............	7	1	6	0	0	1	1	2	18
Total..............	20	13	9	66	9	2	1	6	126
No. of other team members trained in mine rescue: (1953)									
Initial..............	5	4	4	7	0	4	8	5	37
Additional...........	17	10	4	25	11	4	7	8	86
Other[1].............	0	1	0	5	0	0	0	0	6
Total..............	22	15	8	37	11	8	15	13	129
Total Trained men:.....	42	28	17	103	20	10	16	19	255
No. of men trained but not qualified by Bureau of Mines physical standards.............	17	8	2	37	6	1	1	4	76
No. of team members having fire-fighting experience............	15	4	5	19	1	0	2	3	49

[1] Trained in 1952.

Nearly all of the underground supervisory personnel have received mine rescue training, and all new supervisors and mining engineers are required to take the training. About 20 percent of the team members have had actual underground fire-fighting experience. These men are called upon in emergencies to assist and to lead the less experienced men, thereby further developing and supplementing the overall training program.

As a result of the training program, many potential fire and accident hazards that normally would have been overlooked have been corrected or minimized, both on the job and at home. The policy of the company has been to provide key men with mine rescue and first-aid training as a fire- and accident-prevention measure in addition to supplementing their mine rescue personnel. Training has further been extended to the local volunteer fire department and nearby community fire departments.

The station's underground training gallery is also used for training employees in proper electrical hookups in safe blasting practices.

STATION AND EQUIPMENT

The new central mine rescue station is near the north-west corner of the Mather mine B shaft change-house and surface-plant building. The building is of masonry and steel construction with 6-inch concrete floors, metal doors, glass-block and steel sash windows, and a roof of 4-inch, reinforced-concrete-asbestos slab covered by a pitch and gravel finish. The building has two floor levels, basement and ground. The main floor ceilings are 15 feet in height, and the rooms are finished inside with glazed tile. The basement-floor walls are of concrete and concrete-block construction, with a cement-plaster finish. The main building is air-conditioned, with automatic thermostat and humidity controls. The mine rescue station portion has separate air-conditioning controls and provisions for opening the outside windows.

Station

The mine rescue station consists of two rooms and a training-gallery tunnel. A plan of the ground-floor lecture and apparatus storage room is shown in figure 3. A plan of the basement training room and connecting branched tunnel training gallery is shown in figure 4.

The lecture and training room of the station is 24 feet wide and 47 feet long. Most of the lectures and training in the use of oxygen breathing apparatus are conducted in this room (fig. 5). The 2-hour oxygen breathing apparatus is stored on a bench (38 inches high by 28 inches wide) along the outer wall of the room. The spare parts cabinets, oxygen pump, washing and disinfecting facilities, drying racks, and coat racks are along the opposite wall. The instructor is provided with a large table, cabinet, blackboard, and charts to illustrate certain items. A double-basin, deep sink with hot and cold running water is provided for cleaning and disinfecting the apparatus mouthpieces and breathing tubes.

The basement floor of the station is used for storage and as a fresh-air base for training maneuvers in the connecting tunnel gallery. The room is 25 feet in width by 56-1/2 feet in length and is provided with a bench along one wall (fig. 6), two showers, a double-basin deep sink, and cabinets. Cardoxide is stored, screened, and charged into the oxygen breathing apparatus in this room.

The training-gallery tunnel is 9 feet by 9 feet in cross section and 87 feet long, with a branch crosscut connecting the tunnel to the outside (fig. 7). A rod ladder to the surface is provided at the stub end of the tunnel. A standard mine electric-blasting switch assembly and a 3-horsepower, axial-flow auxiliary blower fan with 14-inch canvas tubing is provided at the training-room entrance to the tunnel.(fig. 8) for use in practical training procedures.

The equipment maintained at the station is as follows:

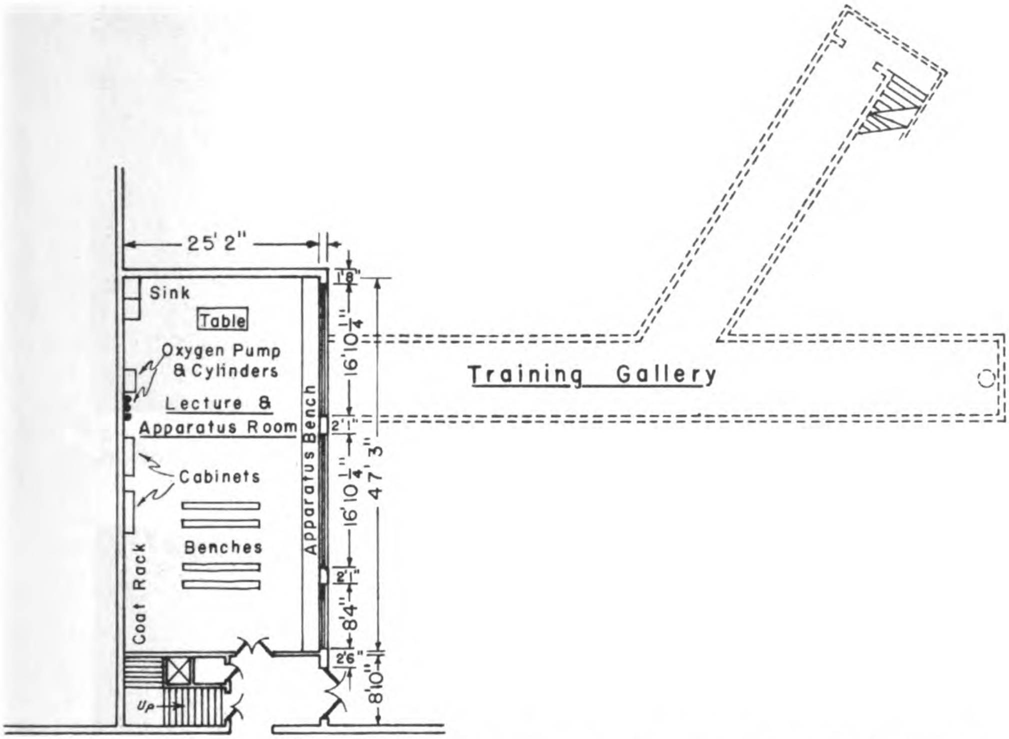

Figure 3. - Ground-floor plan of mine rescue station, Mather mine B shaft, The Cleveland-Cliffs Iron Co.

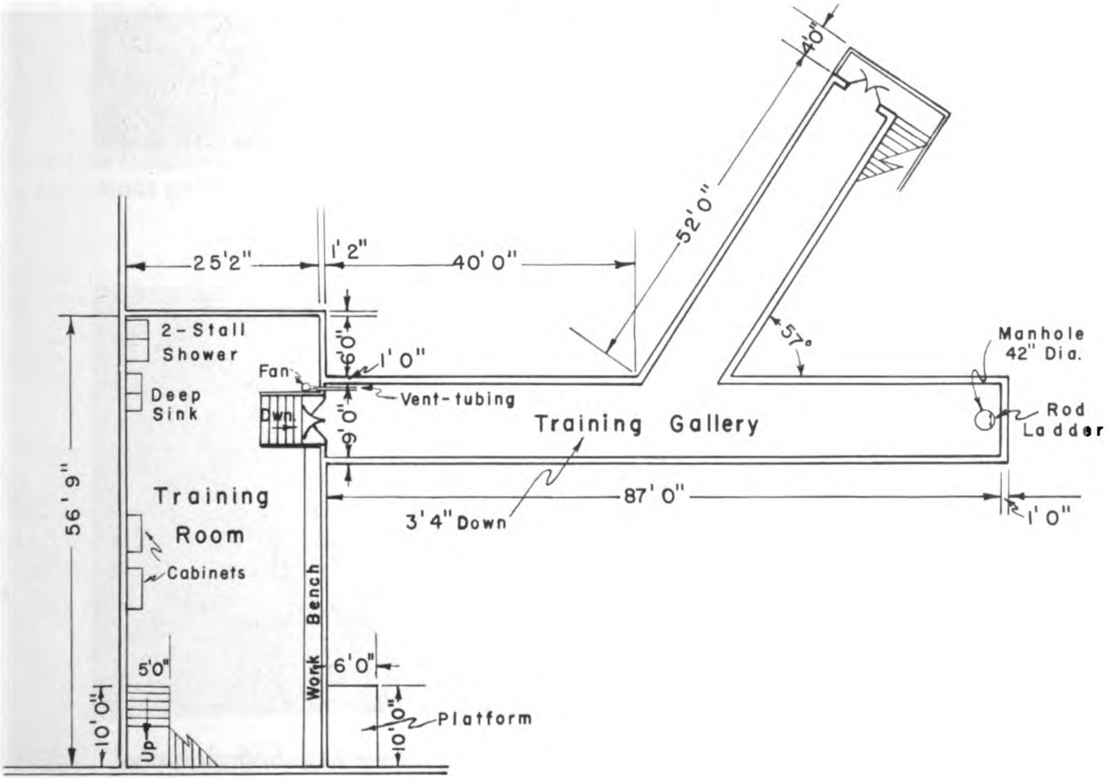

Figure 4. - Basement plan of mine rescue station, Mather mine B shaft.

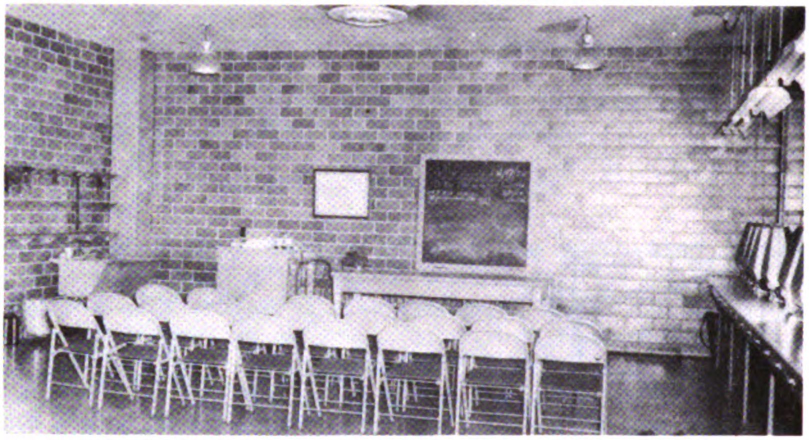

Figure 5. - Lecture and apparatus room of mine rescue station.

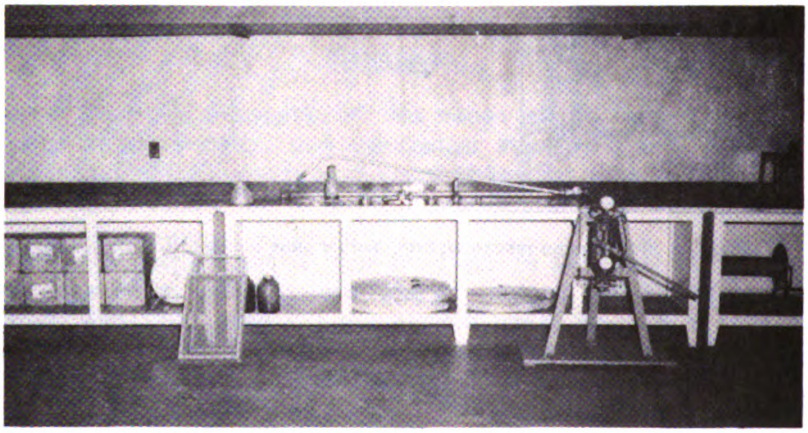

Figure 6. - Storage and work bench in basement training room of mine rescue station.

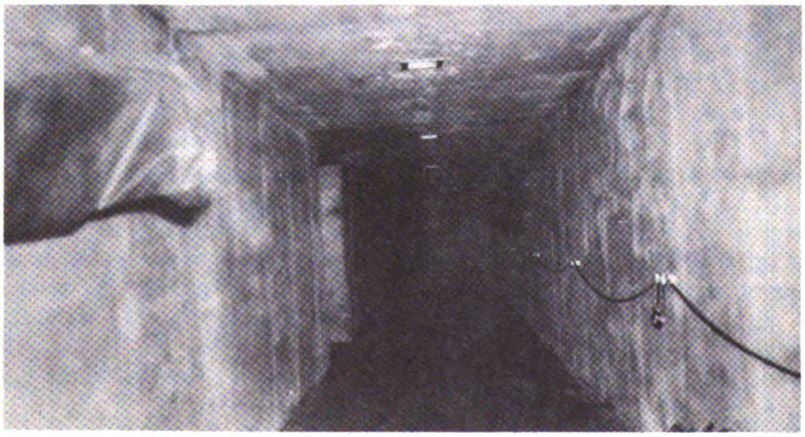

Figure 7. - Mine rescue training gallery with branch tunnel on the left leading outside.

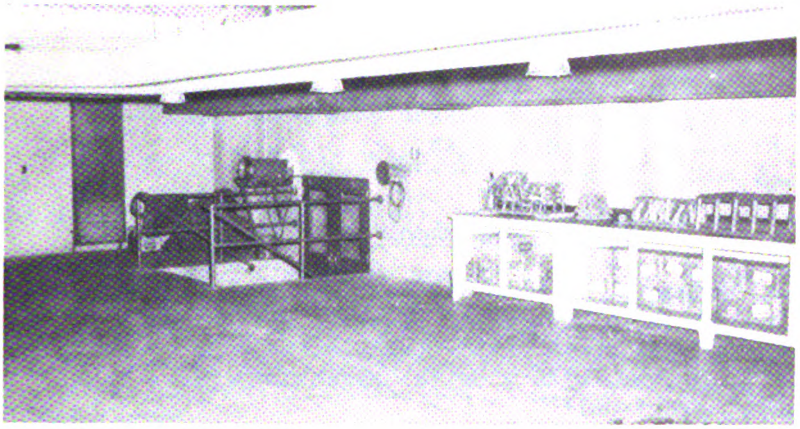

Figure 8. - Training-room entrance to tunnel gallery showing ventilation fan for practice maneuvers.

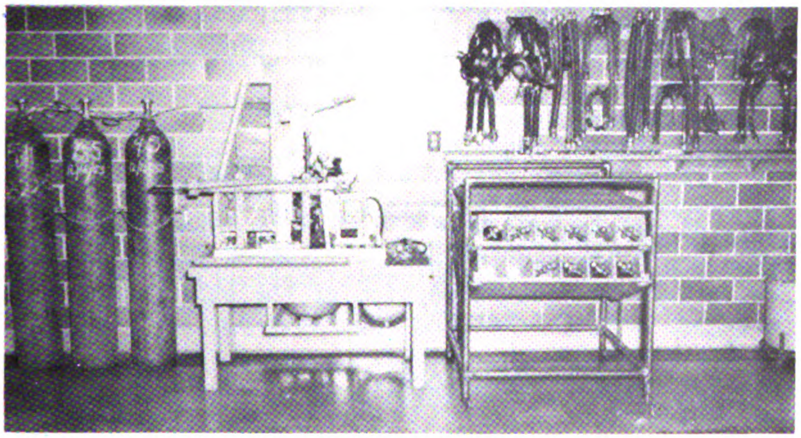

Figure 9. - Oxygen pump and equipment.

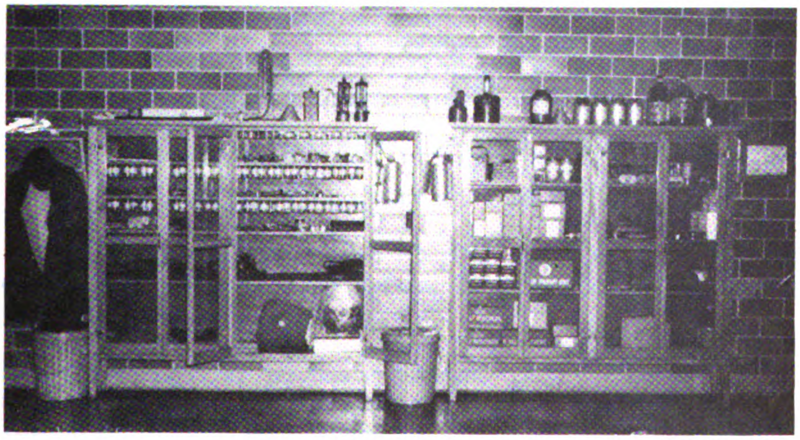

Figure 10. - Cabinet for storing small parts, supplies, and equipment.

Apparatus and other protective breathing equipment

15 sets of McCaa 2-hour oxygen breathing apparatus
6 sets of Chemox 3/4-hour oxygen breathing apparatus
12 M.S.A. All-Service gas masks
36 M.S.A. self-rescuers

Service equipment and supplies

1 M.S.A. oxygen pump, motorized and equipped with a drying tube (fig. 9) and 5 changes of Drierite for oxygen pump drying tube
2 Draeger oxygen pumps, hand-operated (overhauled in 1953)
1 H & H Inhalator, with 3 extra oxygen bottles
1 oxygen therapy unit
2 M.S.A. colorimetric carbon monoxide testers, with 150 dozen sampling tubes
3 M.S.A. Hoolamite carbon monoxide detectors, with 146 dozen sampling tubes
1 M.S.A. carbon monoxide indicator, hand-operated, with 15 15 changes of chemicals
1 M.S.A. carbon monoxide standard alarm unit, with 15 changes of chemicals
2 flame safety lamps, key lock
3 flame safety lamps, magnetic lock
1 Fyrite carbon dioxide tester with extra chemicals
1 Fyrite oxygen tester with extra chemicals
2 portable Orsat apparatus
3 large oxygen cylinders (Note: at least 24 more are available from the mine warehouse section of the building)
13 extra 2-hour oxygen breathing apparatus bottles
1,368 pounds of Cardoxide
41 All-Service gas mask canisters
110 Chemox canisters
2 rope life-line and reel assemblies (1,000 feet each)
1 M.S.A. Maskfone with 1,000 feet of cable
24 pairs of nod-and-shake water goggles
1 master gage
1 manometer gage
2 safety cans for storing naphtha
2 screens for screening fines out of the Cardoxide
A supply of germicidal detergent for cleaning and sterilizing

The following supply of parts (fig. 10) for repairing and servicing the McCaa 2-hour oxygen breathing apparatus:

16 complete sets of tools
5 reducing valves
7 pressure gauges
7 metal mouthpieces
11 rubber mouthpieces
3 breathing bags
1 cooler and regenerator
15 breathing tubes
12 by-pass tubes
8 pressure-gage tubes

11 inhalation hoses
10 exhalation hoses
An ample supply of small parts and gaskets, buckets, soap cans, scrubbing brushes, and metal waste-disposal cans

Auxiliary Equipment

The following auxiliary equipment is available outside the rescue station:

5 McCaa 2-hour oxygen breathing apparatus.....	Mather mine A shaft.
5 Chemox apparatus	Do.
5 Chemox apparatus	Spies-Virgil mine.
2 flame safety lamps	Do.
2 flame safety lamps	Bunker Hill mine.
1 H & H Inhalator	Safety Dept. Office
1 H & H Inhalator	Spies-Virgil mine.
1 Hoolamite carbon monoxide detector	Bunker Hill mine.

In addition, 58 All-Service gas masks have been distributed among the company's underground mines, and 1,500 self-rescuers were placed underground at strategic locations for emergency use. Extra brattice cloth is available at each mine.

Special Equipment

The following special equipment is available:

1 geophone (available at the Ishpeming general office)
20 dozen ventilation smoke tubes and several aspirating bulbs
1 mercury-type ventilation pressure gage
19 rolls of 60-inch-wide brattice cloth
1 large first-aid kit
1 basket-type metal stretcher, extra long length
1 portable cart for the 2-hour apparatus spare oxygen bottles (capacity of 24)
1 carbon monoxide chart
5 50-ft. lengths of 1-1/2-inch fire hose
2 fox nozzles and extension applicators
2 sets of hose couplings, wrenches, and pipe fittings from 1-inch to 4-inch size pipe
1 2,000 c.f.m. Jeffery Aerodyne midget blower and 14-inch ventilation tubing for the training gallery
22 gas-sampling bottles
A supply of blue-denim jackets for training purposes

FIRE-FIGHTING FACILITIES AT COMPANY MINES

First-aid equipment and various types of fire extinguishers are maintained at all strategic places recommended by the safety department and insurance company inspectors, both underground and on surface.

Waterlines for fire-fighting purposes extend to the top of all mine headframes, and most of these are equipped with sprays that can be operated from the surface. These lines are kept dry in cold weather. All main drifts and crosscuts are equipped with waterlines (2-inch minimum size) with gate-type valves and hose connections every 150 feet. At least one underground fire truck (fig. 11) is maintained at each mine. A list of the equipment kept on a fire truck is given below:

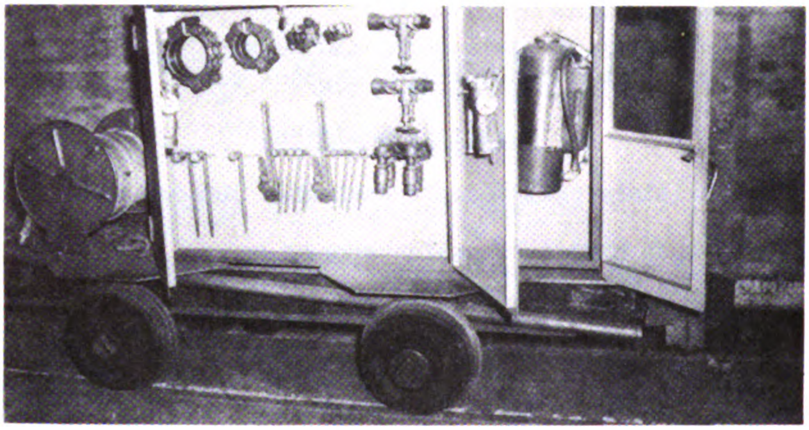

Figure 11. - Fire truck for emergency use, Mather mine B shaft.

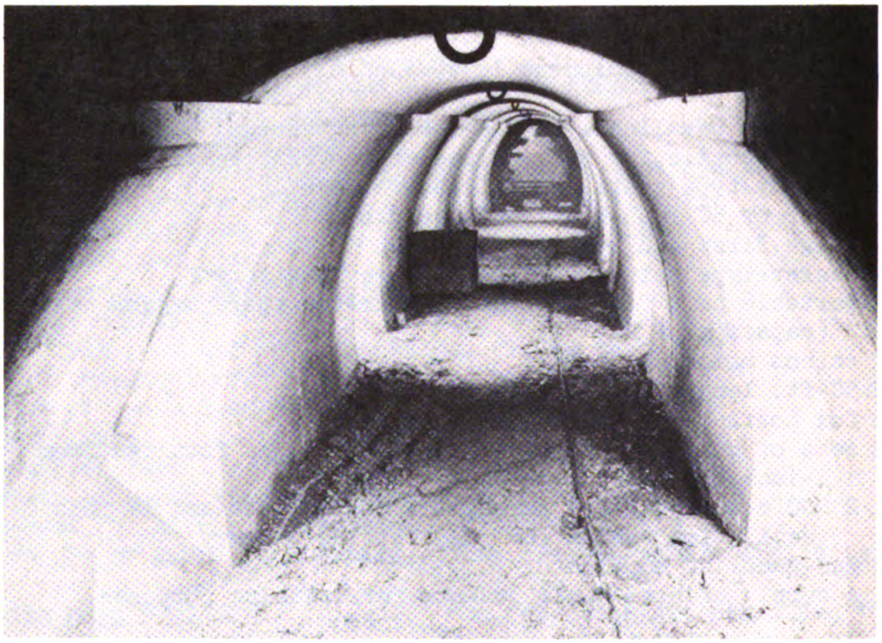

Figure 12. - Concrete-supported scraping drift.

2	30-pound dry chemical extinguishers
1	200-foot reel of 1-inch fire hose
2	1-inch fire-hose water nozzles
2	1-inch fire-hose fog nozzles
2	6-inch Victaulic pipe couplings and wrenches
2	4-inch Victaulic pipe couplings and wrenches
2	2-inch Victaulic pipe couplings and wrenches
2	1-inch Victaulic pipe couplings and wrenches
2	gate valves fitted with a 1-inch air-hose coupling to a 2-inch Victaulic pipe coupling
4	pipe connections, 1-inch air-hose coupling to 2-inch fire-hose coupling
2	18-inch Stillson pipe wrenches
2	round-point shovels
2	hand ripsaws
1	6-pound sledge
2	pole picks
2	single-bitted axes
2	3-1/2-foot bars

All of the shafts at the soft-ore mines have fire doors placed so that each shaft can be isolated in case of fire, and each mine is equipped with mechanical ventilation with reversible main fans. Stench warning devices are placed on the compressed-air lines entering the mines and are tested annually. Emergency outlets are marked with conspicuous signs underground and inspected regularly. Smoking is prohibited underground. Fire patrols go through each mine after the shift preceding any ide period and at least once every 24 hours thereafter; and, except where it is absolutely necessary, all electric power is cut off during idle periods. Underground and surface fire maps are kept up-to-date and posted at each mine in the mining captain's office. Spare copies are kept at the engineer's office. All surface plants are equipped with standard fire hydrants, and at least 500 feet of fire hose is kept nearby in buildings. The mine rescue station equipment is inspected and tested regularly by the safety department personnel.